into a free metallic condition on the surface so as to act afterwards as ordinary iron.

I need scarcely refer here to the probable existence of a very close connection between the phenomena which Professor Schoenbein has thus pointed out with regard to iron, and those which have been observed by others, as Ritter and Marianini, with regard to secondary piles; and A. de la Rive with respect to peculiar affections of platina surfaces.

In my *Experimental Researches* (par. 212) I have recorded a case of voltaic excitement, which very much surprised me at the time,, but which I can now explain. I refer to the fact stated, that when platina and iron wire were connected voltaically in association with fused nitrate or chloride of silver, there was an electric current produced, but in the reverse direction to that expected. On repeating the experiment, I found that when iron was associated with platina or silver in fused nitrate or chloride of silver, there was occasionally no current, and when a current did occur it was almost constantly as if the iron was as platina, the silver or platina used being as zinc. In all such cases, however, it was a thermo-electric current which existed. The volta-electric current could not be obtained, or lasted only for a moment.

When iron in the peculiar inactive state was associated with silver in nitric acid sp. gr. 1.35, there was an electric current, the iron acting as platina; the silver gradually became tarnished and the current continued for some time. When ordinary iron and silver were used in the nitric acid there was immediate action and a current, the iron being as zinc, to the silver as platina. In a few moments the current was reversed, and the relation of the metals was also reversed, the iron being as platina, to the silver as zinc; then another inversion took place, and then another, and thus the changes went on sometimes eight or nine times together, ending at last generally in. a current constant in its direction, the iron being as zinc, to the silver as platina: occasionally the reverse was the case, the predominant current being as if the silver acted as zinc.

This relation of iron to silver, which was before referred to, page 324, produces some curious results as to the precipitation of one metal by another. If a piece of

clean iron is put into an aqueous solution of nitrate of silver, there is no immediate apparent change of any kind. After several days the iron will become slightly discoloured, and small irregular crystals of silver will appear; but the action is so slow as to require time and